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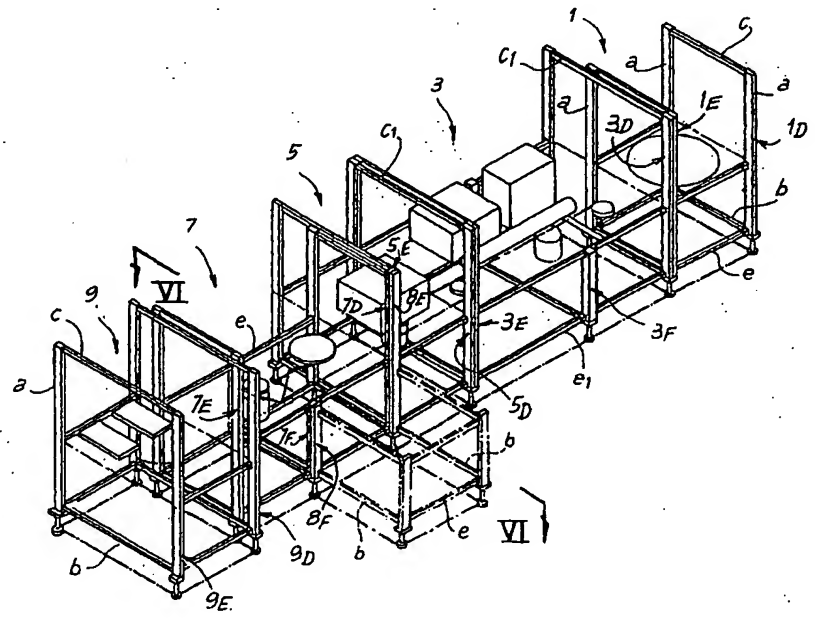
(54) Title: MODULAR SYSTEM MADE OF STEEL STRUCTURAL WORK FOR A PACKAGING LINE




(57) Abstract: The system comprises, for each packaging machine (1, 3, 5, 7, 9) a casing structure defining a parallelepipedal space which, in plan view, has sides of a length equal to corresponding integer multiples of pre-set modules. The structure comprises connecting frames (1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E) which develop mainly in a transverse vertical plane and have pre-set dimensions as chosen in a modular series.



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# MODULAR SYSTEM MADE OF STEEL STRUCTURAL WORK FOR A PACKAGING LINE

## DESCRIPTION

The present invention relates to a system for creating a packaging line – for example for packaging pharmaceutical products or the like – comprising a series of machines designed to carry out, in succession, steps for packaging a product, said machines being inserted in a modular system made of steel structural work. Each of said packaging machines generally comprises a working surface to which the operating functional elements of the machine itself are applied. Said machines are generally designed and/or built by different firms according to respective standards, and consequently involve somewhat burdensome operations, since each time the construction is new and different, for them to be connected together and to the various facilities (electric power-supply lines or lines for driving the equipment, pneumatic lines, etc.) by means of frames for support and containment made of steel structural work.

The purpose of the present invention is to simplify the above operations and to provide a modular structure made of steel structural work within which the various machines and the respective facilities are to be housed. Said structure, once made known to the manufacturers of the packaging machines that are to form the line, makes it possible to connect the machines themselves up to one another and up to the various facilities according to pre-set criteria of modularity.

In practice, according to the invention, each machine is considered as a casing structure defining a parallelepipedal space which, in plan an side vieww, has sides of a length equal to integer multiples of pre-set modules. In particular, the development in height comprises elements which are themselves modular, and affords the availability of technical spaces above the machines for housing facilities and appurtenances, such as control boards, electrical power-supply lines, and so forth. Each casing structure comprises frames that can be applied to the corresponding machines, the frames having a development mainly in a transverse vertical plane and having pre-set

dimensions as chosen in a modular series. The adjacent structures for adjacent machines are connected together by means of said respective connecting frames. In this way, adjacent machines interface with one another by means of the respective connecting frames which, in so far as they are modular, can be easily joined together.

In a preferred embodiment of the invention, each connecting frame is U-shaped with two side uprights rigidly connected at the bottom ends thereof by a cross member by means of welding or any other equivalent system. In side view, the said cross member is preferably contained within the thickness of the uprights of the respective connecting frame and is flush with said uprights at least on one side. The uprights and the cross members of said connecting frames preferably have a rectilinear pattern and a cross section which is preferably rectangular.

At the bottom ends of the uprights of the connecting frames it is possible to apply, by means of screws or a similar connecting system, adjustable resting feet, so as to enable easy levelling of the line with respect to the floor.

The uprights and cross members of said connecting frames preferably have holes distributed along their development at a pre-set pitch. Said holes are designed to connect the frame – by means of screws or bracket anchors – to the operating part of the corresponding machine, namely to the working surface of the latter, and – by means of screws and possible spacers – to another connecting frame applied to an adjacent machine.

The modular system made of steel structural work according to the invention may also comprise cross members of a modular length that are to be set between the connecting frames of a casing structure of a machine.

The modular system made of steel structural work may moreover also comprise intermediate frames designed to be set between two end connecting frames of a corresponding casing structure and to be connected to said frames by means of said modular cross members. The function of said intermediate frames is to provide supplementary supports for machines of a considerable length. The conformation of said intermediate frames is similar to that of the connecting frames, i.e., with two side uprights joined together by

a bottom cross member, and they are provided with resting feet in positions corresponding to the respective uprights. The rectangular cross section of the uprights of the connecting frames preferably has the length of the side orthogonal to the plane in which the frame lies equal to the length of a linear modulus (s), whereas in the uprights of the intermediate frames the corresponding dimension is twice as long (2s). The other dimensions of the section of the frames may be equal either to said linear modulus (s) or to twice said linear modulus. The system thus has a range of frames which differ from one another as regards the cross section of the respective uprights and which can be joined together at the uprights to form composite uprights having a cross section comprised in a square the side of which is 2 x (s). This possibility, as will emerge clearly in the example described hereinafter, makes it possible to maintain modularity in the lay-out both for a line of aligned machines and for a line of machines with side branches.

At least some of said connecting and intermediate frames may extend in height at least as far as a common surface for supporting working surfaces of the packaging line, said common surface being set, for example, at 90 cm from the machine-resting and operator-treading surface.

To the top ends of the uprights of at least some of said connecting and/or intermediate frames there may be applied, for instance by means of screws, vertical extensions having a modular length, which in turn are connected together by means of modular cross members so as to form a top structure. Said structure is provided for containing parts of individual machines or of accessory frames of the latter, such as transparent or non-transparent guards, control boards, electrical facilities, pneumatic facilities or the like, or even ducting for the passage of electrical, pneumatic, lubrication, or suction lines, or the like, for supplying the various machines of the packaging line.

The system made of steel structural work may comprise modular panels providing an enclosure for the boundary of the space occupied by the line. Said panels may be made of transparent or non-transparent sheeting, of sound-proofing material, or of any other suitable material, and have modular

dimensions according to the dimensions of said connecting and intermediate frames and of the corresponding connecting cross members and vertical extensions.

The system according to the invention therefore enables the manufacturers of the various packaging machines to know beforehand the boundary conditions that the machine that they have designed and produced is to meet, so avoiding subsequent problems of connection and interfacing and enabling the use of standard components, such as enclosure panelling, electrical switchboards, connectors for electrical and pneumatic lines, lighting and air-suction systems, sound-proofing systems and systems for technical separation of the processes, with ensured economic advantages and advantages in terms of quality.

A better understanding of the present invention will be provided by the ensuing description and by the attached drawing, which illustrates a non-limiting example of the invention and in which:

Fig. 1 is a schematic perspective view of the machines of a packaging line and of the spaces necessary for each of them;

Fig. 2 is a perspective view of a modular structure made of steel structural work according to the invention, which is designed to contain the machines of the packaging line of Fig. 1;

Figs. 3 and 4 respectively show a front view and a horizontal cross section of a typical connecting frame according to the invention;

Fig. 5 is a schematic illustration of a series of types of connection frames and a series of types of intermediate frames, which are distinguished by uprights having different modular sections;

Fig. 6 is a partial cross-sectional view of the structure according to a horizontal plane VI-VI of Fig. 2;

Fig. 7 is a perspective view of the structure illustrated in Fig. 2, completed with an overlying modular structure made of steel structural work;

Fig. 8 is a perspective view of the modular structure made of steel structural work illustrated in Fig. 7 with a number of enclosing panels applied thereto;

Fig. 9 is a perspective view of the structure of Fig. 8 exploded in two parts, namely the top part and the bottom part; and

Fig. 10 is a perspective exploded view of the structure of Fig. 8, with the individual machines set in the respective modular casing structures according to the invention.

With reference to Fig. 1, the packaging line illustrated by way of example comprises:

- a loading device 1 comprising a rotary table 1Z of a circular shape, which has, on its periphery, a series of seats (not shown in the drawing) for housing bottles or flasks that are to be filled and packaged;
- a filling and closing machine 3, which is designed to introduce, into each bottle or the like, a pre-set amount of a product and then to set, on the mouth of the bottle, a closing cap;
- a capping machine 5, designed to fix, for example by squeezing or clinching their edges, the caps on the bottles in order to render closing thereof stable;
- a labelling machine 7 designed to affix appropriate labels on the bottles; and
- a boxing machine 9 designed to arrange a number of prepared bottles in an orderly way inside a box 9Z.

A transfer system – known per se– is provided for transferring the bottles between one machine and the next, for example by means of conveyor belts, so as to cause the individual bottles to advance in succession according to a path 2 between one machine and another, in the order in which said machines have been described, from the loading table 1Z of the device 1 to a box 9Z set in the boxing machine 9.

The various packaging machines are illustrated applied to respective working surfaces 1A, 3A, 5A, 7A, 9A that extend according to respective overall dimensions in a rectangular lay-out, each working surface being characterized by respective transverse and longitudinal sides 1B, 1C; 3B, 3C; 5B, 5C; 7B, 7C; 9B, 9C. The aforesaid sides, according to the invention, are integer multiples of a pre-defined modular length. The working surfaces of

adjacent machines are set alongside one another.

Fig. 2 illustrates a modular structure made of steel structural work for containing said line of packaging machines, obtained by means of tubular section. For each machine there is provided a pair of connecting frames 1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E, which develop mainly according to respective transverse vertical planes. The various frames have a similar shape, and for the description thereof it will suffice to refer to a typical frame shown in Figs. 3 and 4. Each frame is U-shaped and comprises two side uprights (a) and a bottom cross member (b) which are welded together. The frame can be completed by a top cross member (c) connected to the uprights (a) by means of screws and possible connecting brackets (not shown in the drawings), as well as by adjustable resting feet (d) screwed underneath the uprights (a).

The modular structure made of steel structural work also comprises longitudinal cross members, such as the one designated by (e) in Fig. 2, which are of different lengths, but in any case a length that is an integer multiple of a pre-set basic length, and which connect together the frames of each of said pairs of frames. For machines having a length greater than that of the longest cross members envisaged, such as the machines 3 and 7, intermediate frames 3F, 7F are provided which are set between the respective connecting frames 3D, 3E; 7D, 7E, and are connected thereto by means of longitudinal cross members (e) having an appropriate modular length. Also the intermediate frames are U-shaped and have, in positions corresponding to the uprights, adjustable feet for resting on the floor.

The uprights (a) of the connecting frames 1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E have a rectangular or square cross section. The cross member (b), which has a rectangular cross section, is welded flush with the uprights in such a way as to be set in, between the latter, in a side view of the frame. The uprights (a) and the cross member (b) have a multiplicity of through holes, such as the ones designated by (h) and (m) in Fig. 3, for connection to the respective machine and to the frame of the adjacent machine, for example by means of screws with nuts.

The modular system made of steel structural work envisages various types of distinct connecting and intermediate frames, according to the dimensions of the sections of the uprights. According to this criterion, and as illustrated schematically in Fig. 5, four types of connecting frames T1, T2, T3, T4 and three types of intermediate frames R1, R2, R3 are envisaged. The cross sections of the uprights have a square or rectangular shape with the sides equal to a modulus (s) or twice said modulus. In this way, it is possible to combine together various types of connecting and intermediate frames, maintaining modular pitches between the resting feet of the frames, and thereby also the modularity of the other elements of the system, such as cross members (e, b), coating panels (n, 3T, 5T, etc.), and so forth. In this way it is also possible to apply, to the packaging line, one or more possible lateral operating units, at the same time maintaining said characteristic of modularity. For example, on the surface with rectangular base indicated by a dotted line 8 in Fig. 2 it is possible to place one of said lateral units provided with a casing structure of its own (as indicated by a dashed line in Figs. 2 and 6) obtained with the modular elements of the system. Said structure comprises at least one connecting frame with uprights 8F, 8E (Fig. 6) applied laterally to the frames 7F; 7D, 5E of the line by means of screws and spacers 10.

The uprights (a) of the connecting frames 1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E extend in height by one and the same amount beyond the working surfaces of the various packaging machines, whereas the uprights of the intermediate frames 3F, 7F are limited between the working surfaces themselves and the respective resting feet. Applied by means of screws or joints (not illustrated in the drawing) on the extensions of the uprights (a) of the connecting frames 1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E are respective pairs of extension uprights, such as the ones designated by 1G, 1H, 1L, 1M in Figs. 5, 6 and 7, which are connected together by means of longitudinal cross members, such as the one designated by (e), and transverse cross members, such as the one designated by (c), to form a structure that overlies the bottom structure previously described and is designed to contain the electric power-supply lines, fluid lines, etc., of the various machines and other possible

facilities and appurtenances. Panels (n) for various purposes (aeration, lighting, etc.) are applied inside the structure in positions corresponding to the bottom ends of said pairs of extension uprights 1G, 1H, 1L, 1M for separating the internal environment of the bottom structure from that of the top structure.

Fig. 10 shows sound-proofing enclosure panelling, such as 1R; 3R; 5N, 5P, 5R, 5S; 7N, 7P, 7R, 7S; 9R (for example, made of sheeting), transparent panelling, such as 3T; 5T; 7T (for example, made of Plexiglas) for checking operation of the respective machines, and control boards, such as 5U, 7U.

With the above arrangement, each machine, such as 1, 3, 5, 7, 9, can come supplied complete with its own bottom casing structure 1V, 3V, 5V, 7V, 9V (Fig. 10) and top casing structure 1W, 3W, 5W, 7W, 9W, thus enabling easy connection with the adjacent machines of the line. Said top and bottom structures can be easily separated from one another, with considerable advantages in terms of transportability and installation. In addition, the definition of the modular connecting frames between the machines of the line facilitates the design and construction of the machines by different suppliers, thus eliminating or substantially reducing problems of interfacing.

It is understood that the drawing only illustrates a possible exemplification of the invention given purely to provide a practical demonstration of the said invention, which may vary in its embodiments and arrangements without thereby departing from the idea underlying the invention. The possible presence of reference numbers in the attached claims has the purpose of facilitating reading thereof in the light of the foregoing description.

CLAIMS

1) A modular system made of steel structural work for a packaging line for example for packaging pharmaceutical products, foodstuff products, or cosmetic products or the like comprising a series of machines designed to carry out, in succession, steps for packaging a product, characterized in that: to each machine (1, 3, 5, 7, 9) there is reserved a casing structure (1V, 1W; 3V, 3W; 5V, 5W; 7V, 7W; 9V, 9W) defining a parallelepipedal space which has, in plan view and in height, sides of lengths equal to corresponding integer multiples of pre-set modules, said structure (1V, 1W; 3V, 3W; 5V, 5W; 7V, 7W; 9V, 9W) comprising connecting frames (1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E) which develop substantially in a vertical plane transverse to the line and which have pre-set dimensions as chosen in a modular series; and in that adjacent structures for adjacent machines are connected together by means of said respective connecting frames.

2) A modular system made of steel structural work according to Claim 1, characterized in that each connecting frame (1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E) is U-shaped with two side uprights (a) rigidly connected at their bottom ends by a cross member (b) by means of welding or other equivalent system.

3) The modular system made of steel structural work according to Claim 2, characterized in that, in a side view, said cross member (b) is contained within the thickness of the uprights (a) of the respective connecting frame and is flush with the uprights (a) at least on one side.

4) The modular system made of steel structural work according to Claim 2 or Claim 3, characterized in that the uprights (a) and the cross member (b) of said connecting frames have a rectilinear development and a substantially rectangular cross section.

5) The modular system made of steel structural work according to one or more of Claims 1 to 4, characterized in that to said bottom ends of the uprights of said connecting frames (1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E) there are applied – by means of screws or other similar system – respective adjustable resting feet (d).

6) The modular system made of steel structural work according to one or more of Claims 1 to 5, characterized in that the uprights (a) and the cross members (b) of said connecting frames have holes (h, m) distributed along their development according to a pre-set pitch, said holes being designed to connect the frame – by means of screws or bracket anchors – to the corresponding packaging machine, namely to its working surface, and – by means of screws – to another similar frame applied to an adjacent machine.

7) The modular system made of steel structural work according to one or more of Claims 1 to 6, characterized in that it comprises cross members (e) of a modular length to be set between two connecting frames of a casing structure of a machine to connect said frames together.

8) The modular system made of steel structural work according to one or more of Claims 1 to 7, characterized in that it comprises intermediate frames (3F; 7F) designed to be set between two connecting frames (3D, 3E; 7D, 7E) of a corresponding casing structure of a machine and to be connected thereto by means of said modular cross members (e), said intermediate frames (3F; 7F) being U-shaped in a way similar to the connecting frames.

9) The modular system made of steel structural work according to one or more of Claims 1 to 8, characterized in that it is provided with corresponding series of types of connecting frames (T1, T2, T3, T4) and intermediate frames (R1, R2, R3), the frames of each series being distinguished from one another by their cross section of a square or rectangular shape with sides equal to a linear modulus (s) of to twice said modulus.

10) The modular system made of steel structural work according to Claim 9, characterized in that the connecting frames of said series (T1, T2, T3, T4) have uprights of a thickness – in the direction orthogonal to the plane of lie of the frame – equal to said linear modulus (s), the other dimension of the section of the uprights being chosen according to the respective combinations shown in Fig. 5.

11) The modular system made of steel structural work according to Claim 10, characterized in that the intermediate frames of said series (R1, R2, R3) have uprights of a thickness – in the direction orthogonal to the plane of

lie of the frame – equal to twice said linear modulus (s), the other dimension of the section of the uprights being chosen according to the respective combinations shown in Fig. 5.

12) The modular system made of steel structural work according to one or more of Claims 1 to 11, characterized in that to at least some of said connecting frames (1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E) and intermediate frames (3F; 7F) there are applied, directly or by interposition of brackets, working surfaces (1A; 3A; 5A; 7A; 9A) of the packaging line.

13) The modular system made of steel structural work according to Claim 12, characterized in that to the top ends of the uprights of at least some of said connecting frames (1D, 1E; 3D, 3E; 5D, 5E; 7D, 7E; 9D, 9E) there are applied – for instance by means of screws – respective modular vertical extensions (1G, 1H, 1L, 1M) which have a modular length and are in turn connected together by means of modular cross members (e, c) to form a top structure (1W; 3W; 5W; 7W; 9W) designed to receive parts of individual machines or accessories thereof, such as transparent or non-transparent protective guards, control panels, electrical units, pneumatic units, or other appurtenances.

14) The modular system made of steel structural work according Claim 13, characterized in that in said top structure (1W; 3W; 5W; 7W; 9W) there are provided ducts for passage of electric power-supply lines, pneumatic lines, lubrication lines, suction lines, and the like, for supplying the various machines of the packaging line.

15) The modular system made of steel structural work according to any one of the foregoing claims, characterized in that it comprises modular enclosure panels (1R; 3R, 3T; 5N, 5P, 5R, 5S, 5T; 7N, 7P, 7R, 7S, 7T; 9R) for enclosing the space of the line, the panels possibly being made of transparent or non-transparent sheeting, of sound-proofing material, or of any other suitable material, and having modular dimensions according to the dimensions of said connecting and intermediate frames and of the corresponding connecting cross members and vertical extensions, and according to the distances between said frames.

16) A modular system made of steel structural work for a packaging line, for example for packaging pharmaceutical products or the like, as described and as represented by way of example in the attached drawings.

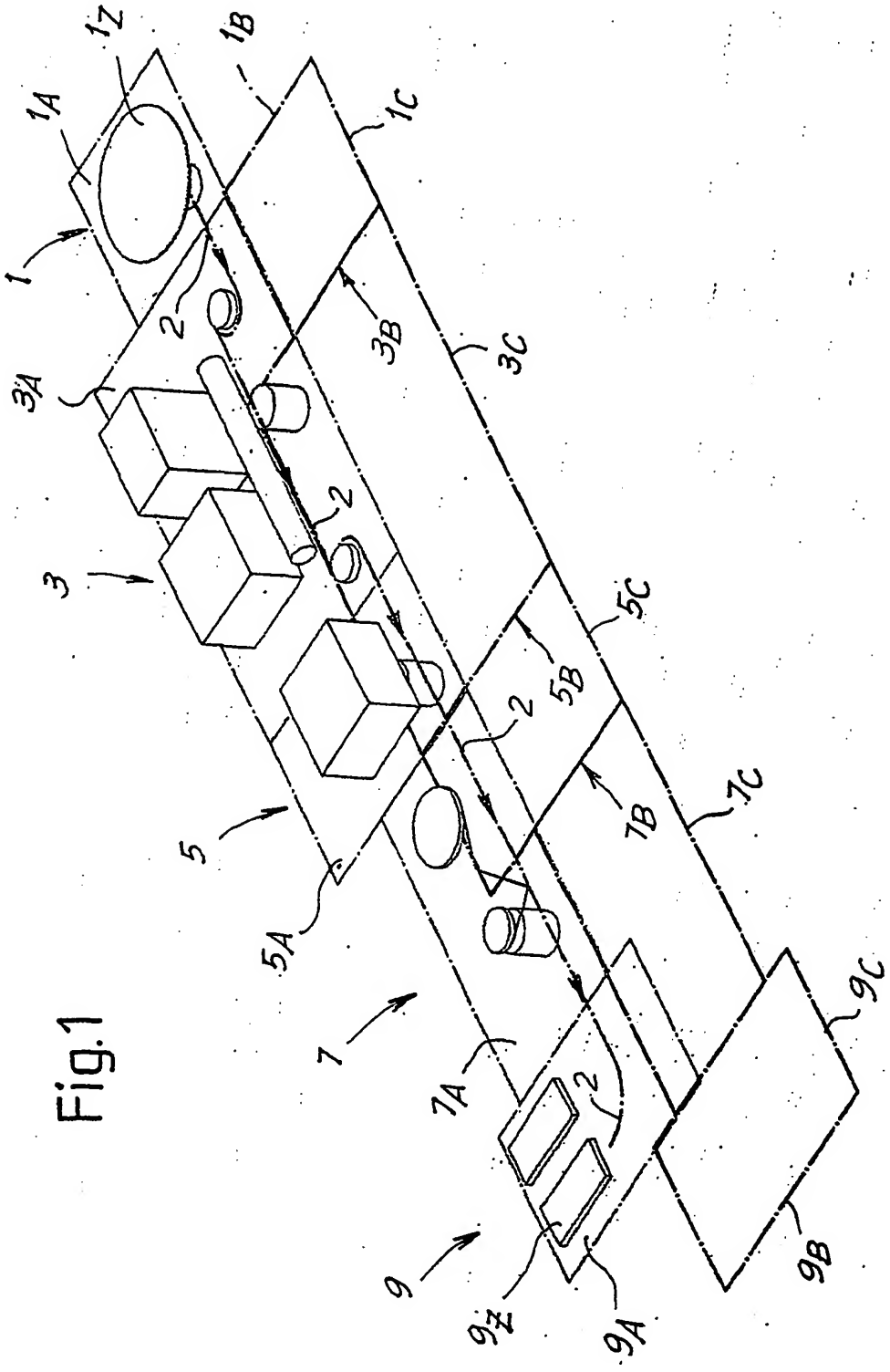
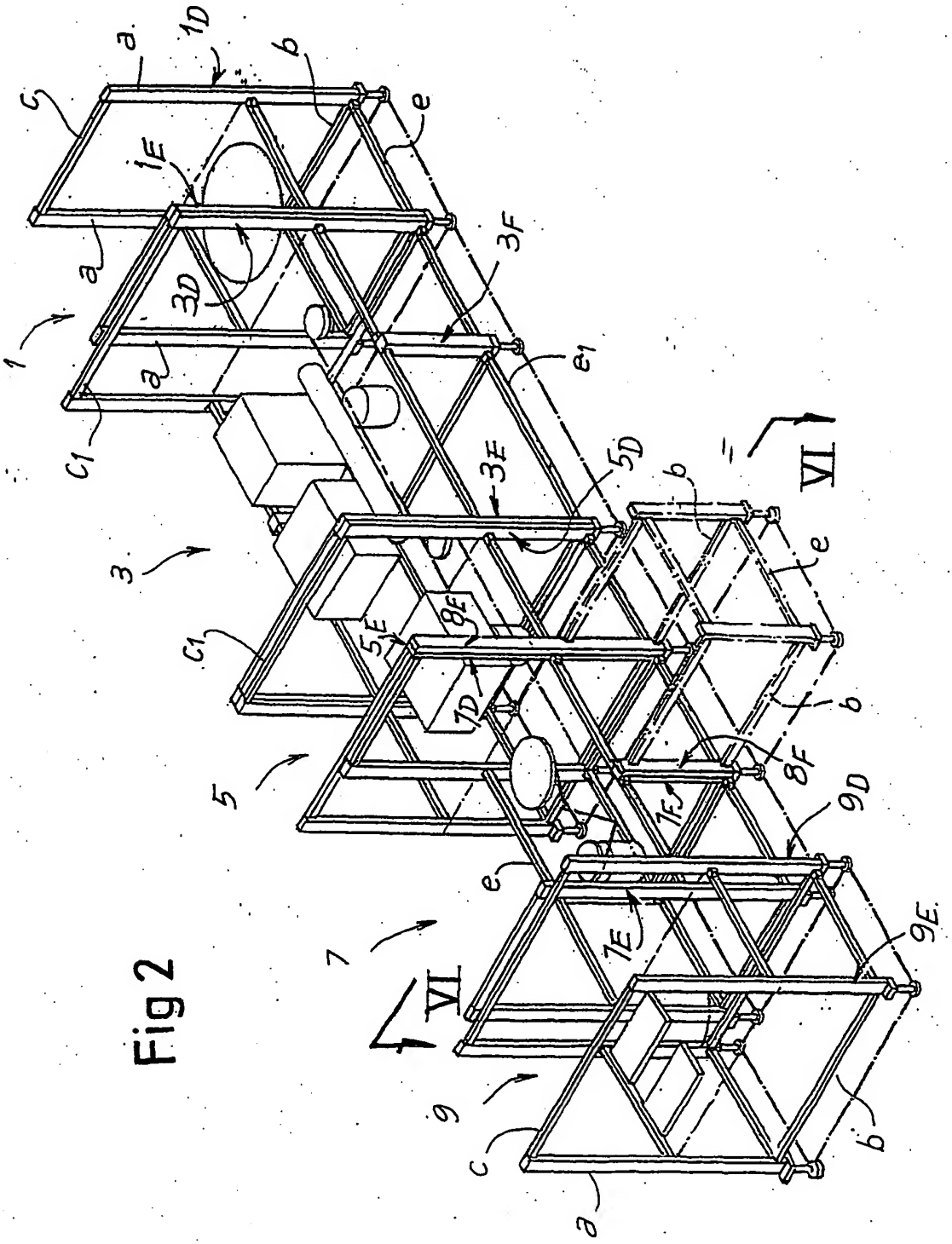



Fig.1


a
1D
b
c
e
1E
3F
3D
1
a
a
e1
c1
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VI
3
b
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c1
5E
8E
7D
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Fig 2

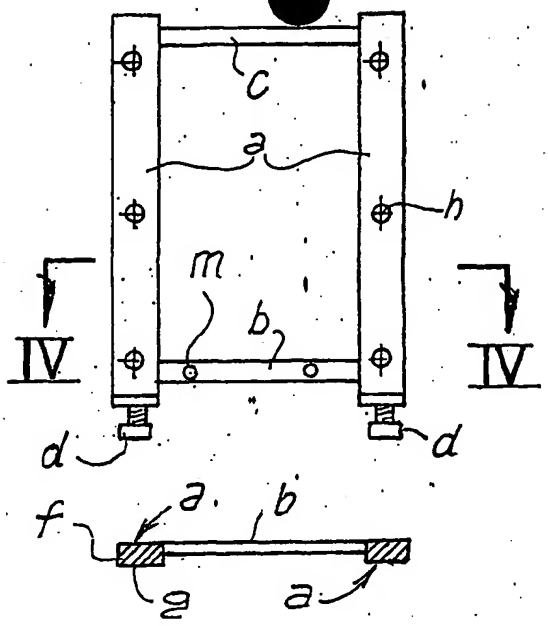
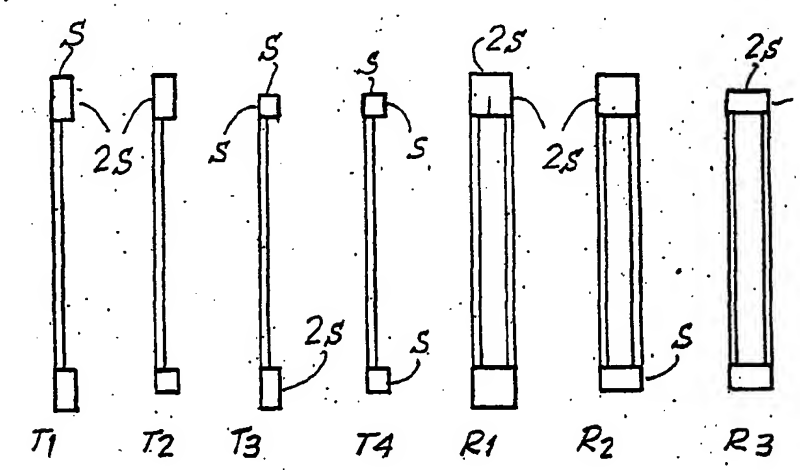



Fig. 3

Fig. 4

Fig. 5



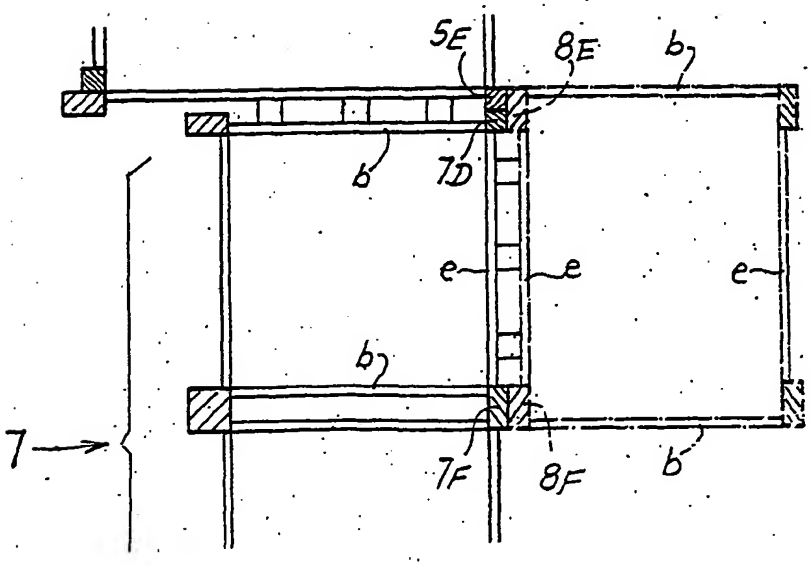




Fig. 6

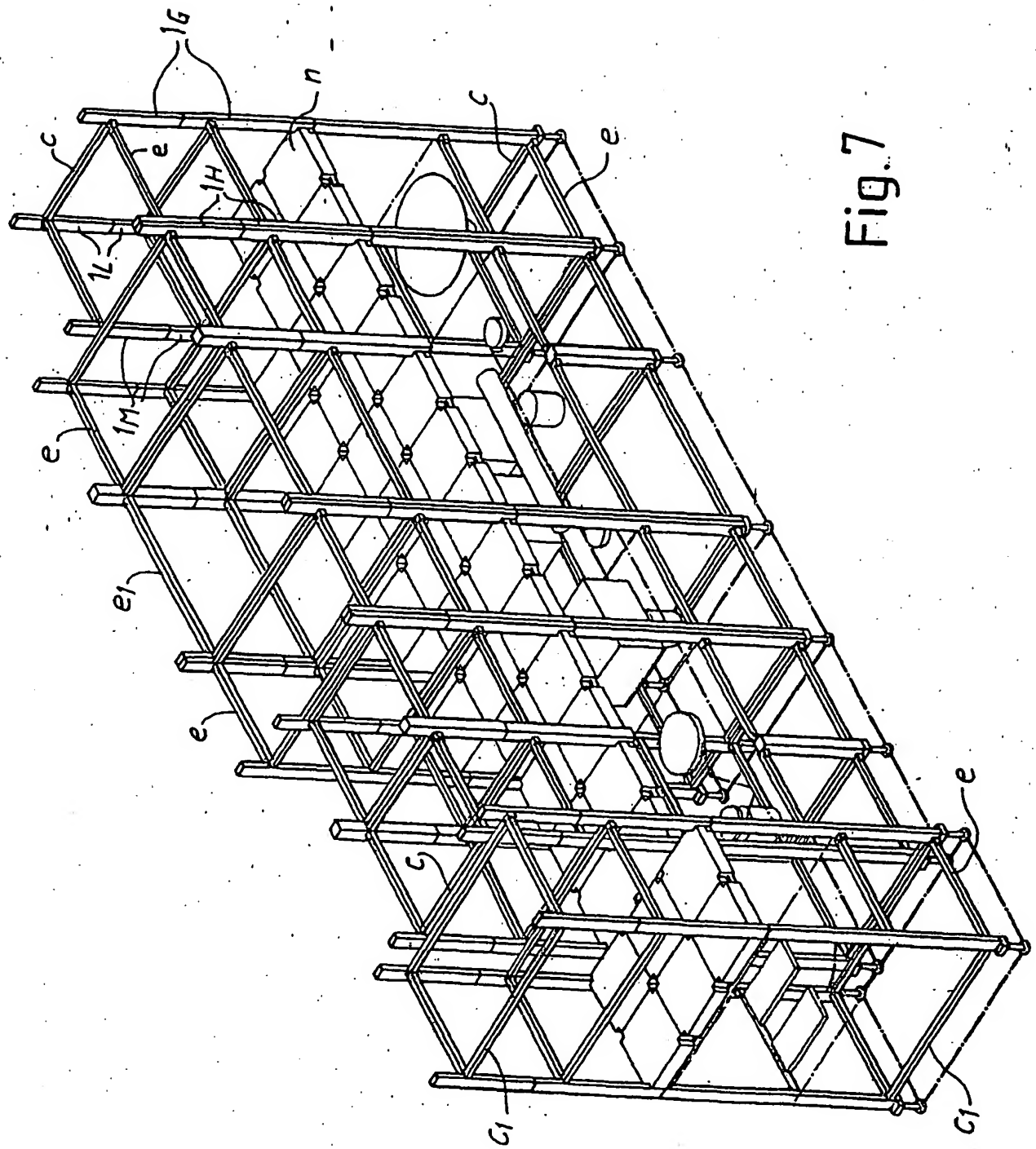



Fig.7

Fig.8

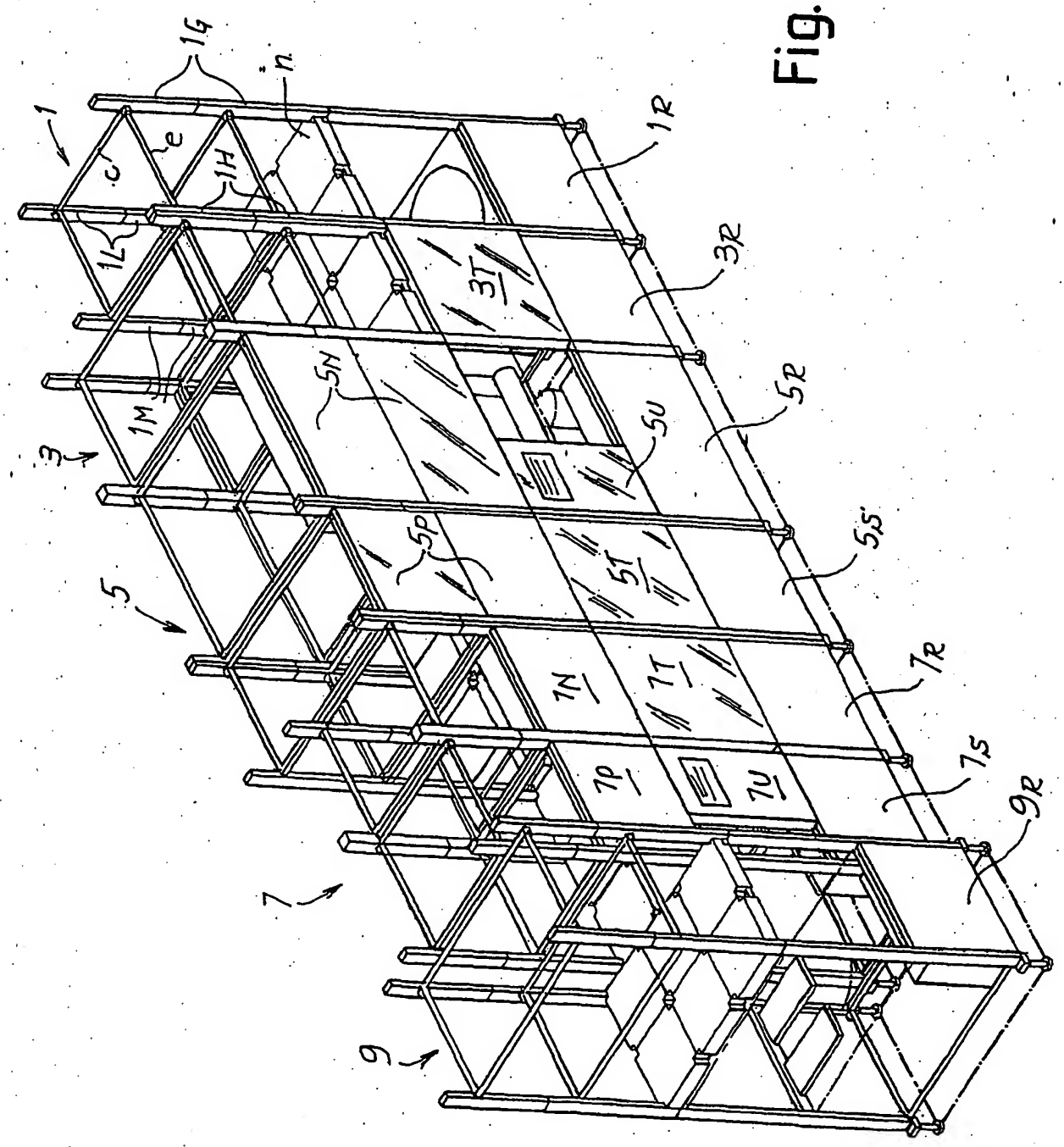


Fig.9

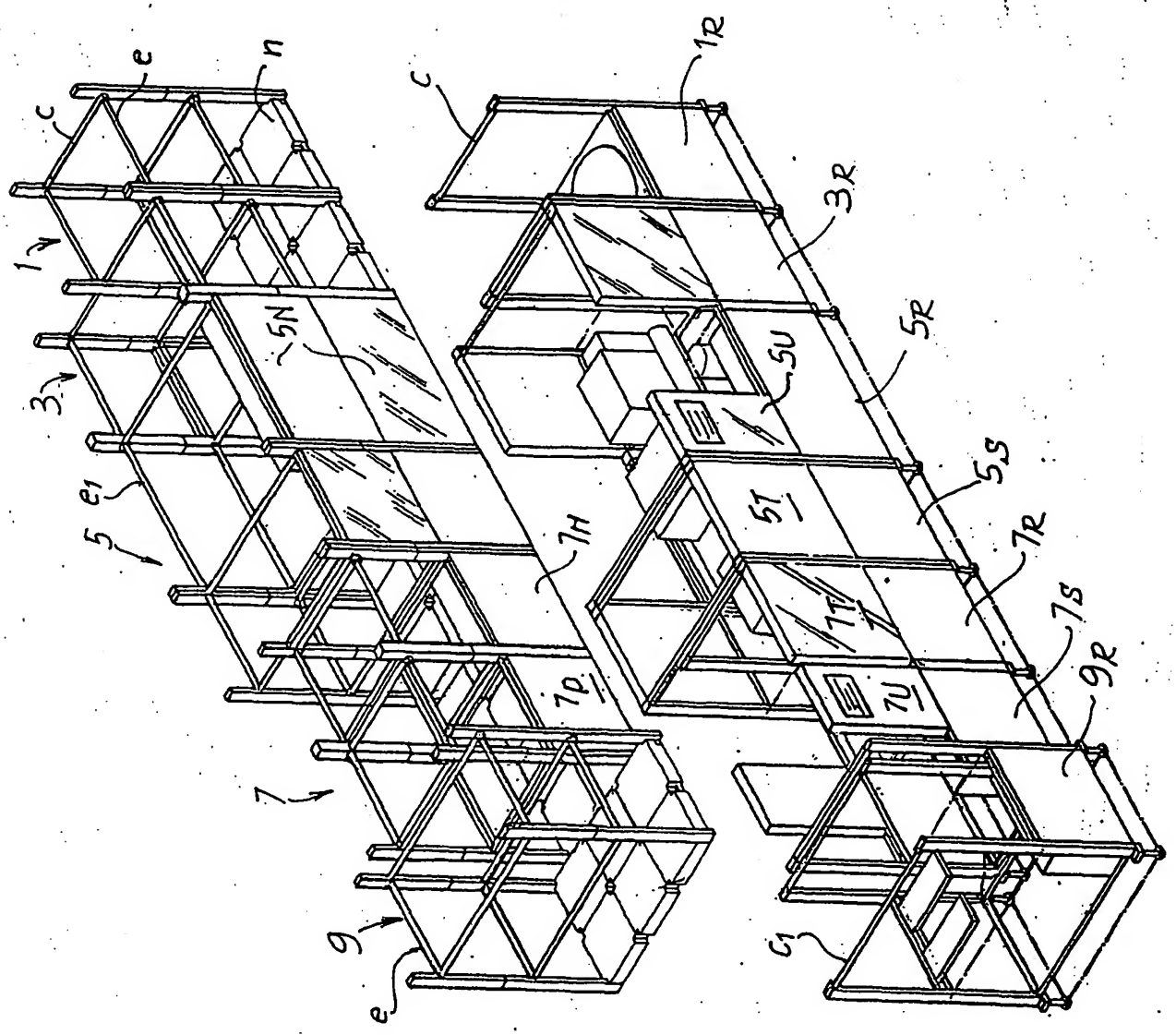
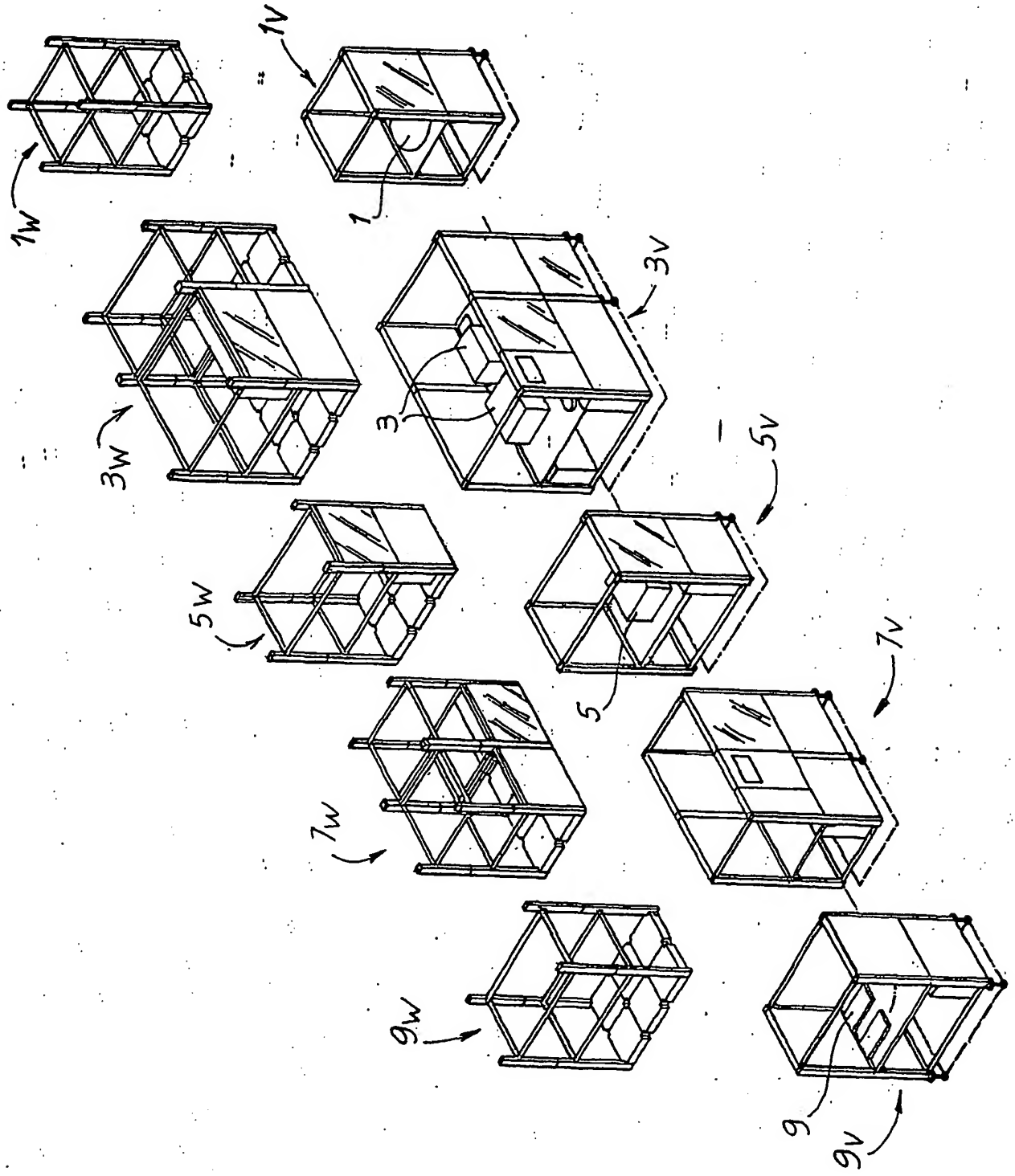


Fig. 10



# INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 01/00632

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65B59/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X<br>Y<br>A | US 4 860 519 A (LEMAIRE DIDIER ET AL)<br>29 August 1989 (1989-08-29)<br>column 2, line 36 -column 4, line 5;<br>figures | 1,2,6,16<br>3-5,7,8,<br>12<br>14 |
| X<br>A | EP 0 959 008 A (SASIB TOBACCO SPA)<br>24 November 1999 (1999-11-24)<br>column 4, line 23 -column 6, line 56;<br>figures | 1,2,16<br>14 |
| Y | US 5 611 442 A (HOWARD JOHN D)<br>18 March 1997 (1997-03-18)<br>column 3, line 57 -column 7, line 18;<br>figures | 3,4,7,8,<br>12 |

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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